Section 4

CONTENTS

FIGURES

TABLES

4. RISK ASSESSMENT APPROACH AND METHODOLOGY

The intent of the Remedial Investigation/Baseline Risk Assessment (RI/BRA) is to evaluate the nature and extent of contamination, fate and transport, and risks associated with site-related contamination contained within the WAG 6 and 10 release sites (i.e., OU 10-04). The site screening for release sites was presented in the *Work Plan for WAGs 6 and 10 OU 10-04 Comprehensive RI/FS* (DOE 1999) and summarized in Section 3 of this report. Section 4.1 summarizes the human health risk assessment (HHRA) methodology used. Section 4.2 summarizes the ERA methodology for WAG 6 and 10. Section 4.3 summarizes the methodology for the OU 10-04 ERA, which considers not only WAGs 6 and 10 sites, like the HHRA, but also sites from all INEEL WAGs. Note that a chemical or site may be retained for ERA that was eliminated from the HHRA. Section 4.4 describes the basic approach taken by the Shoshone-Bannock Tribes in their qualitative analysis of WAG 6 and 10 risks.

4.1 Waste Area Groups 6 and 10 Human Health Risk Assessment Methodology

This subsection summarizes the assessment methodologies that were used in the OU 10-04 HHRA. These methodologies were generally consistent with the methods used in other INEEL comprehensive RI/FSs, while accounting for the unique aspects of the WAG 6 and 10 sites. The HHRA methodologies are discussed in greater detail in Appendix D.

4.1.1 Data Evaluation

All past field investigation data were evaluated for the OU 10-04 RI/BRA (EDF-ER-230). The evaluation was organized so that relationships between site investigation results for each medium (groundwater, perched water, soil, soil gas, and air) are apparent. A data summary was prepared to describe the quantities and concentration of specific contaminants in the specific environmental media (Appendix C), and the potential transport mechanisms and the expected fate and transport of contaminants in air and groundwater media were modeled as appropriate. Finally, the data evaluation process involved the reduction of data into maps, tables, and graphs that help summarize the nature and extent of contamination at the WAG 6 and 10 release sites.

4.1.2 Exposure Assessment

The HHRA quantified the receptor intake of COPCs for each WAG 6 and 10 site. The assessment consisted of estimating the magnitude, frequency, and duration of exposure for each exposure route between the environment and human receptors. The exposure routes that were evaluated for the WAG 6 and 10 release sites are summarized in the preliminary conceptual site model (PCSM) presented in Figures 4-1 and 4-2. The occupational scenario was evaluated at the current time and 100 years in the future, and the residential scenario was evaluated only at 100 years in the future. Child exposures were incorporated into the soil ingestion risk calculations for the residential scenario because studies have shown that children can receive proportionately more exposure to contamination through soil ingestion than adults typically receive. Although ponds are listed as a source of contaminants, there are currently no active ponds listed under OU 10-04 sites. Infiltration is listed as a release mechanism of concern for assessment only because ponds were used at some sites in the past.

In general, the exposure routes shown in Figures 4-1 and 4-2 are consistent with the INEEL Track 2 Guidance (DOE 1994) with some exceptions. First, the HHRA evaluated risks from the ingestion of contaminated homegrown produce and dermal exposure to contamination. These exposure routes are not covered by the INEEL Track 2 Guidance, but were evaluated in the HHRA to be consistent with other WAG Comprehensive HHRAs.

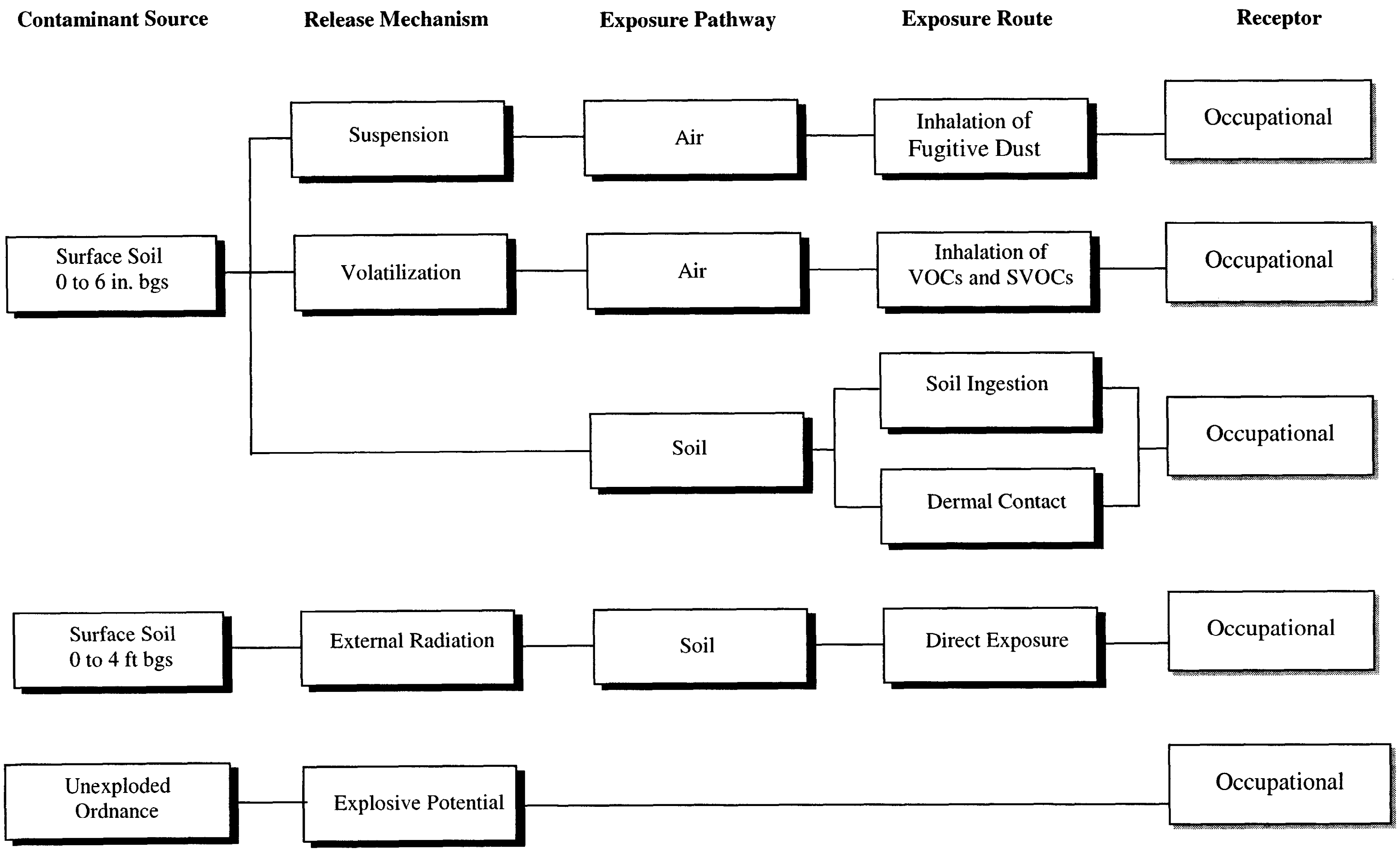

Figure 4-1. Occupational exposure scenario preliminary site conceptual model.

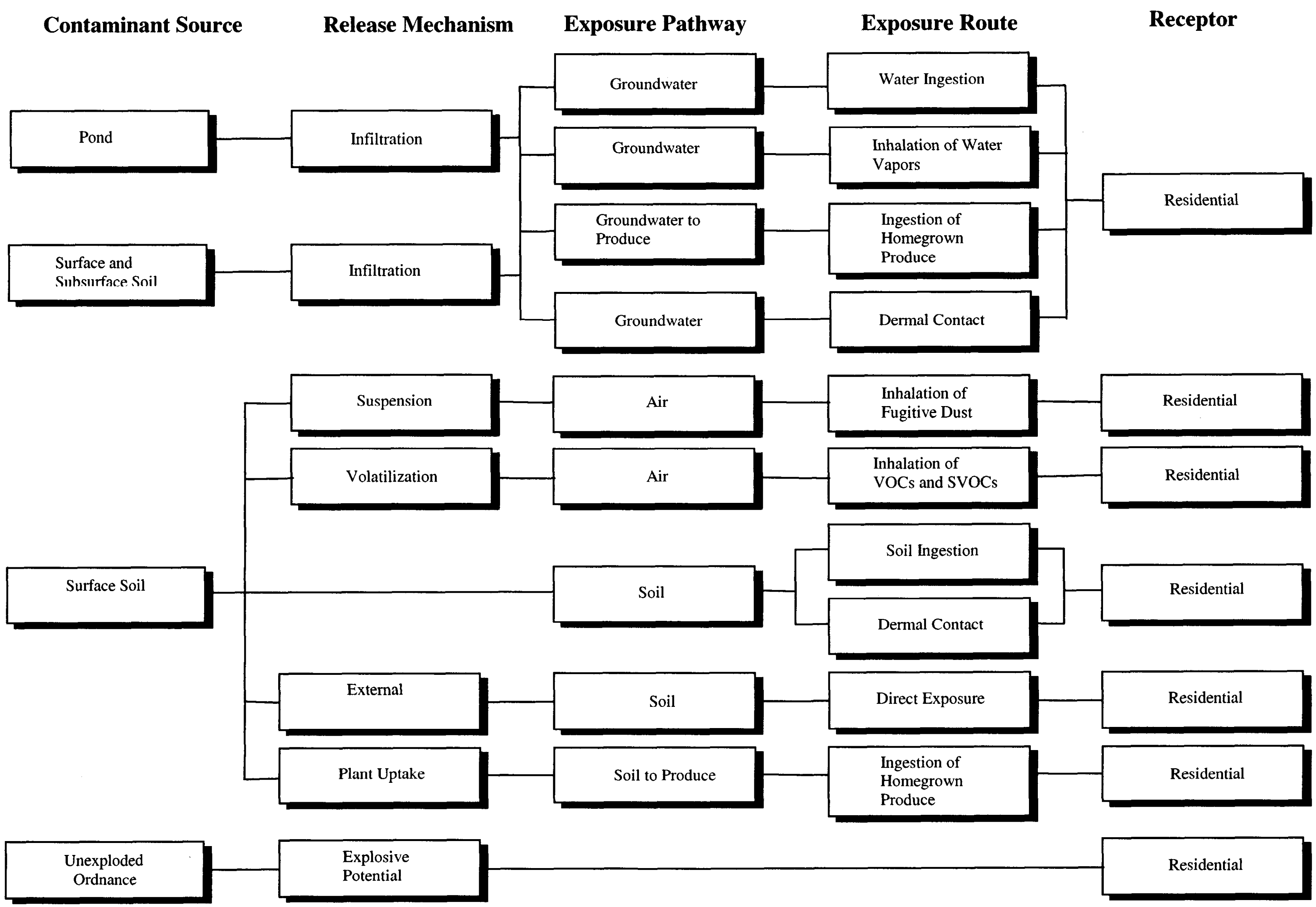

Figure 4-2. Residential exposure scenario PCSM.

Second, the explosive potential of UXO was qualitatively evaluated in the HHRA. The Track 2 Guidance does not address risks from the explosive potential of UXO, but the potential is included in the PCSM because it produces possible risks for workers and future residents. Risks from exposure to the chemical constituents contained in the UXO were also evaluated in accordance with the Track 2 Guidance. These chemical risks are included in the PCSM under the "Surface Soil" contaminant source heading. This is discussed in more detail in Section 12.

Ranchers, hunters, and occasional recreational receptors could become exposed to contamination at WAG 6 and 10 sites. Exposure scenarios have not been developed to directly evaluate risks to these groups, because the residential and occupational scenarios bound the risks to receptors that receive infrequent exposures. In other words, as long as the level of risk is acceptable to hypothetical residents and workers, risks to ranchers, hunters, and recreational receptors will also be acceptable. The standard residential and occupational scenarios may not fully address risks to Native Americans, who are occasional visitors to the INEEL that could be exposed to contamination at WAG 6 and 10 sites. The scenarios that assess the risks to Native Americans are summarized in Section 4.4, and the results of the qualitative analysis are presented in Appendix A and summarized in appropriate sections of the main report.

To quantify receptor intakes, the following activities were performed as part of the OU 10-04 BRA:

- Identification of contaminant sources
- Identification and characterization of exposed populations
- Evaluation of exposure pathways
- Estimation of contaminant concentrations at points of exposure for the following exposure pathways
  - Groundwater pathway
  - Air pathway
  - Soil pathway
  - UXO hazard.
- Estimation of contaminant intakes (chronic daily intakes) for comparison to toxicity values.

4.1.3 Toxicity Assessment and Risk Characterization

The toxicity values that were used in the BRA were obtained from the following sources. The primary source of information was EPA's Integrated Risk Information System (IRIS). The IRIS contains only those toxicity values that have been verified by EPA's Reference Dose or Carcinogen Risk Assessment Verification Endeavor (CRAVE) work groups. The IRIS database is updated monthly and supersedes all other sources of toxicity information. If the necessary data were not available in IRIS, EPA's Health Effects Assessment Summary Table (HEAST) (EPA 1994) was used as the next most preferable information source. The HEAST contains a comprehensive listing of provisional risk assessment information that has been reviewed and accepted by individual EPA program offices, but has not had enough review to be recognized as high-quality, agencywide information (EPA 1994).

4.1.3.1 Toxicity Assessment and Risk Characterization for Carcinogenic Contaminants.

Contaminants. Potential carcinogenic risks were expressed as an estimated probability that an individual might develop cancer from lifetime exposure. This probability is based on projected intakes and chemical-specific dose-response data called cancer slope factors (SFs). Cancer SFs and the estimated daily intake of a contaminant, averaged over a lifetime of exposure, were used to estimate the incremental risk that an individual exposed to that contaminant may develop cancer.

4.1.3.2 Toxicity Assessment and Risk Characterization for Noncarcinogenic Contaminants.

Contaminants. Potential noncarcinogenic effects were evaluated by comparing calculated daily intakes with chronic reference doses (RfD) developed by EPA. A chronic RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of the daily exposure that can be incurred during a lifetime, without an appreciable risk of a noncancer effect being incurred in human populations, including sensitive subgroups (EPA 1989). The RfD is based on the assumption that thresholds exist for noncarcinogenic toxic effects (e.g., liver or kidney damage). If chronic daily intakes exceed this threshold level, there is a potential that some adverse noncarcinogenic health effects will be observed in exposed individuals.

For risk characterization purposes, potential health effects of chronic exposure to noncarcinogenic compounds were assessed by calculating a hazard quotient (HQ) for each COPC. The HQ is calculated by dividing the chronic daily intake by the RfD. A HQ greater than 1.0 indicates that exposure to a given contaminant may cause adverse health effects in exposed populations. HQ values do not represent a probability or a percentage. For example, a HQ of 10 does not indicate that adverse health effects are 10 times more likely to occur than a HQ value of 1.0. All one can conclude is that HQ values greater than 1.0 indicate that noncarcinogenic health impacts are possible and that the more a HQ value exceeds unity, the greater the concern about potential adverse health effects.

HQs were summed across exposure routes to calculate a hazard index (HI) for each COPC. Individual pathway HI values were then summed to determine a cumulative HI value for all exposure pathways and COPCs at each release site.

4.1.4 Uncertainty Analysis

The risk assessment results presented in this BRA are very dependent on the methodologies described in Section 4.1. These analysis methods were developed over several years by INEEL risk management and risk assessment professionals to provide realistic, yet conservative, estimates of human health risks at WAG 6 and 10. If different risk assessment methods had been used, different risk assessment results would probably have resulted. To ensure that the risk estimates used in this BRA are conservative, health protective assumptions that tend to bound the plausible upper limits of human health risks are used throughout. Therefore, risk estimates that might be calculated by other risk assessment methods would not likely be significantly higher than the estimates presented here.

The BRA results in Appendix E are useful because results are calculated in a consistent manner. This consistency allows for direct comparison of the risk assessment results for a given site with the results for every other site included in the evaluation. Changes in a given assumption used in the evaluation would, in general, produce similar changes in the risk results for all of the sites evaluated. Although the BRA results include inherent uncertainty, consistency of analysis makes the results useful for making remediation decisions for WAGs 6 and 10.

Uncertainty in this BRA is introduced during the following four stages of analysis:

1. Data collection and evaluation

2. Exposure assessment

3. Toxicity assessment

4. Risk characterization.

In the following subsections, each of these four stages is discussed in more detail. A discussion of the baseline risk assessment (BRA) human health assessment uncertainty factors can be found in Table 4-1. A discussion of risks from potential future releases from co-located facilities within WAG 6 or 10 is presented in Section 4.1.5.

4.1.4.1 Data Collection and Evaluation Uncertainties. Uncertainties associated with data collection and evaluation are created by variability in observed concentrations resulting from sampling design and implementation, laboratory analysis methods, seasonality, contaminant levels, and natural concentration. Making the most effective use of sampling data involves quantifying these uncertainties.

The effect of uncertainty introduced from sample collection and analysis is reduced by basing risk estimates on the 95% UCL of the mean for the WAG 6 and 10 COPC concentration estimates. The resulting concentration estimates, used to estimate intakes, are an upper-bound estimate of the concentrations observed at the retained sites. This approach provides protection for human health and accounts for the uncertainty introduced by sampling, analysis, seasonality, and natural variation.

A major assumption included in the BRA analysis is that all significant sources of contamination at WAGs 6 and 10 have been identified and sampled. If a source of contamination has not been identified and sampled, the risks from the contamination are not included in the BRA.

One of the first steps in the BRA was reviewing sites and screening contaminants (screening tables are presented in Appendix C). The purpose of the review was to help focus the BRA on sites and contaminants that are likely to produce adverse human health effects. The process was designed to be conservative so that all sites and contaminants that have a reasonable potential for causing adverse human health effects would be evaluated in the BRA. If in fact the process was not conservative enough and sites or contaminants that could cause adverse human health effects were inappropriately omitted, then the BRA risk results presented in Appendix E would be underestimated. A contamination source would have to be small to be inappropriately screened. Therefore, any underestimation of risk would be slight if a site or contaminant were inappropriately screened.

The contaminant screening process described in Appendix D-1.1 used the EPA Region 3 or 9 risk-based concentrations (RBCs) as a screening criterion (EPA 1995). These concentrations were calculated based on a risk of 1E-06 and an HQ of 1.

The text included with the Region 3 screening tables recommends using one-tenth of the concentrations shown in the tables as the basis for contaminant screening. Region 9 recommends using the risk-based concentration (RBC) divided by the number of contaminants. The WAG 6 and 10 BRA assessed only the COPCs that remained after screened based on the RBC. However, as discussed in Appendix C, a sensitivity analysis was conducted based on either one-tenth the RBC or the RBC divided by the number of contaminants. No COPCs were identified as being concerns. This is documented in the footnotes of Appendix C screening tables. This is considered acceptable because remedial decisions at the INEEL are generally based on the residential risk level of 1E-04. In other words, if a site's estimated residential risk exceeds a value of 1E-04, the site is typically considered for remedial action. The 1E-04 risk level is two orders of magnitude greater than the 1E-06 risk level that was used to calculate the Region 3 risk-based concentration, so the 1E-06 RBCs are adequately protective.

Table 4-1. BRA human health assessment uncertainty factors.

Uncertainty Factor	Effect of Uncertainty	Comment
Source term assumptions	May overestimate risk	All contaminants are assumed to be completely available for transportation away from the source zone. In reality, some contaminants may be chemically or physically bound to the source zone and unavailable for transport.
Natural infiltration rate	May overestimate risk	A conservative value of 10 cm/year was used for this parameter.
Moisture content	May overestimate or underestimate risk	Soil moisture contents vary seasonally in the upper vadose zone and may be subject to measurement error.
Water table fluctuations	May slightly overestimate or underestimate risk	The average value used is expected to be representative of the depth over the 30-year exposure period.
Mass of contaminants in soils estimated by assuming a uniform contamination concentration in the source zone.	May overestimate or underestimate risk	There is a possibility that most of the mass of a given contaminant at a given site may exist in a hotspot that was not detected by sampling. If this condition existed, the mass of the contaminant used in the analysis might be underestimated. However, 95% upper confidence levels (UCLs) or maximum detected contamination were used for all mass calculations. These concentrations are assumed to exist at every point in each waste site; therefore, the mass of contaminants used in the analysis is probably overestimated.
Plug flow assumption in groundwater transport	Could overestimate or underestimate risk	Plug flow models are conservative relative to concentrations because dispersion is neglected, and mass fluxes from the source to the aquifer differ only by the time delay in the unsaturated zone (the magnitude of the flux remains unchanged). For nonradiological contaminants, the plug flow assumption is conservative because dispersion is not allowed to dilute the contaminant groundwater concentrations. For radionuclides, the plug flow assumption may or may not be conservative. Based on actual travel time, the radionuclide groundwater concentrations could be over or underestimated because a longer travel time allows for more decay. If the concentration decrease from the travel time delay is larger than the neglected dilution from dispersion, the model will not be conservative.
No migration of contaminants from the soil source prior to sampling	Could overestimate or underestimate risk	The effect of not modeling contaminant migration from the soil before sampling is dependent on the contaminant half-life, radioactive ingrowth, and mobility characteristics.
Chemical form assumptions	Could overestimate or underestimate risk	In general, the methods and inputs used in contaminant migration calculations, including assumptions about chemical forms of contaminants, were chosen to err on the protective side. All contaminant concentration and mass are assumed available for transport. This assumption results in a probable overestimate of risk.

Table 4-1. (continued).

Uncertainty Factor	Effect of Uncertainty	Comment
Exposure scenario assumptions	May overestimate risk	The likelihood of future scenarios has been qualitatively evaluated as follows: Resident—improbable Industrial—credible. The likelihood of future onsite residential development is small. If future residential use of this site does not occur, then the risk estimates calculated for future on-site residents are likely to overestimate the true risk associated with future use of this site.
Exposure parameter assumptions	May overestimate risk	Assumptions about media intake, population characteristics, and exposure patterns may not characterize actual exposures.
Receptor locations	May overestimate risk	Groundwater ingestion risks are calculated for a point at the downgradient edge of an equivalent rectangular area. The groundwater risk at this point is assumed to be the risk from groundwater ingestion at every point within WAG 6 and 10 boundaries. Changing the receptor location will only affect the risks calculated for the groundwater pathway because all other risks are site-specific or assumed constant at every point within the WAG 6 and 10 boundaries.
For the groundwater pathway analysis, all contaminants were assumed to be homogeneously distributed in a large mass of soil.	May overestimate or underestimate risk	The total mass of each contaminant of potential concern (COPC) is assumed to be homogeneously distributed in the soil volume beneath each WAG 6 and 10 site/area. This assumption tends to maximize the estimated groundwater concentrations produced by the contaminant inventories because homogeneously distributed contaminants would not have to travel far to reach a groundwater well drilled anywhere within the WAG 6 and 10 boundary. However, groundwater concentrations may be underestimated for a large mass of contamination (located in a small area with a groundwater well drilled directly downgradient).
The entire inventory of each contaminant is assumed to be available for transport along each pathway	May overestimate risk	Only a portion of each contaminant's inventory will be transported by each pathway.
Exposure duration	May overestimate risk	The assumption that an individual will work or reside at a site for 25 or 30 years is conservative. Short-term exposures involve comparison to subchronic toxicity values, which are generally less restrictive than chronic values.
Noncontaminant-specific constants (not dependent on contaminant properties)	May overestimate risk	Conservative or upper bound values were used for all parameters incorporated into intake calculations.
Exclusion of some hypothetical pathways from the exposure scenarios	May underestimate risk	Exposure pathways are considered for each scenario and eliminated only if the pathway is either incomplete or negligible compared to other evaluated pathways.
Model does not consider biotic decay	May overestimate risk	Biotic decay would tend to reduce contamination over time.
Occupational intake value for inhalation is conservative	Slightly overestimates risk	Standard exposure factors for inhalation have the same value for occupational as for residential scenarios though occupational workers would not be onsite all day.

Table 4-1. (continued).

Uncertainty Factor	Effect of Uncertainty	Comment
Use of cancer slope factors	May overestimate risk	Slope factors are associated with upper 95th percentile confidence limits. They are considered unlikely to underestimate true risk.
Toxicity values derived primarily from animal studies	May overestimate or underestimate risk	Extrapolation from animal to humans may induce error from differences in absorption, pharmacokinetics, target organs, enzymes, and population variability.
Toxicity values derived primarily from high doses; most exposures are at low doses	May overestimate or underestimate risk	Assumes linearity at low doses. Tend to have conservative exposure assumptions.
Toxicity values and classification of carcinogens	May overestimate or underestimate risk	Not all values represent the same degree of certainty. All are subject to change as new evidence becomes available.
Lack of slope factors	May underestimate risk	COPCs without slope factors, may or may not be carcinogenic through the oral pathway.

In addition, the BRA methodologies for noncarcinogens are sufficiently conservative to preclude inappropriate remedial decisions that might result from screening contaminants. For example, the noncarcinogenic assessment used in the BRA implements upper-bound values for all exposure factors and treats all noncarcinogenic health effects additively (i.e., all noncarcinogens were assumed to produce adverse health impacts in the same organ). Degradation of noncarcinogens in the environment is not considered. These conservative methods tend to produce upper-bound HQ estimates for all COPCs that passed the screening process and to increase the chance that a given site would be considered for remediation.

All of the sites evaluated in the BRA have varying levels of uncertainty associated with the contaminant concentrations evaluated in the BRA. In addition, all of the evaluated concentrations were estimated using conservative assumptions about the nature and extent of contamination at the various sites. The calculation and use of exposure point concentrations (EPCs) are presented in Appendix C. The concentration term uncertainties and conservative assumptions are summarized in Table D-1.

As discussed above, the sampling results for all the retained sites were assumed to be lognormally distributed. This assumption is in accordance with EPA guidance. (EPA 1992a) In general, this assumption causes the 95% UCL calculations to produce higher average concentration estimates than would be produced if the sampling results were assumed to be normally distributed. If the sampling results for a given site were normally distributed, the calculated risks for the site would be overestimated as a result of the lognormal distribution assumption.

4.1.4.2 Exposure Assessment Uncertainties. Uncertainties associated with the exposure assessment are created by characterizing transport, dispersion, and transformation of COPCs in the environment, establishing exposure settings, and deriving estimates of chronic intake. The initial characterization that defines the exposure setting for a site involves many professional judgments and assumptions. Definition of the physical setting, population characteristics, and selection of the chemicals included in the risk assessment are examples of areas for which a quantitative estimate of uncertainty cannot be achieved because of the inherent reliance on professional judgment.

An aspect of the risk assessment that tends to exaggerate risk results is the evaluation of contaminants with background concentrations that produce calculated risks in excess of 1E-06. An example of this type of contaminant is arsenic. This contaminant is commonly detected in INEEL soils at concentrations that are slightly higher than accepted risk-based concentrations. However, this contaminant is not associated with known waste-producing processes at WAG 6 or WAG 10, it falls within background concentrations discussed in Appendix K and arsenic has very high toxicity values. For these reasons, arsenic was not included in the risk assessment for some sites in which it has been detected. If the detected arsenic concentrations are in fact anthropogenic (i.e., produced by operations at the sites), the risk results for the sites would be underestimated.

Biotic transport is included in the preliminary conceptual site model (Appendix F) as a release mechanism because of the possibility that burrowing animals and nonagricultural plant uptake could transport contamination from depth up to the ground surface. The potential for biotic uptake was acknowledged in the WAG 6 and 10 RI/BRA, but biotic uptake modeling was not performed to quantify the effects of biotic uptake because most contaminant exposures calculated in the RI/BRA were based on average soil concentrations that were measured in the depth interval from 0 to 10 ft (0 to 3 m). In general, plants and animals at WAG 6 and 10 sites would not come into contact with soils that are at depths greater than 3 m (10 ft) below ground surface; therefore, biotic uptake generally will not affect the average concentrations used to calculate site exposures. To illustrate this point, consider a burrowing animal that moves contamination from a depth of 1 m (3 ft) up to the surface at a given site. This activity will not affect the calculated average concentrations in the 0 to 10 ft (0 to 3 m) depth interval but will simply redistribute contamination within that interval.

The case in which biotic activity could affect the average concentrations used to calculate exposures in the RI/BRA is associated with the occupational exposure scenario. Most of the occupational scenario soil pathways and all of the occupational scenario air pathways were evaluated using contaminant concentrations measured in the top 15 cm (6 in.) of soil. Including the effects of biotic uptake could change these concentrations.

Despite the fact that the occupational exposure scenario average concentrations could be affected by biotic uptake, biotic uptake modeling was not performed to support the occupational scenario analysis for four reasons:

1. The occupational scenario evaluates a 100-year period of time when institutional controls will be in place at some of the WAG 6 and 10 sites. These controls will probably discourage biotic activity that would move large amounts of contamination to the surface.

2. The 100-year time period is a relatively short interval for the movement of contamination. Some contamination may be transported to the surface during this period, but the amount is expected to be small.

3. Many of the WAG 6 and 10 sites were created by surface releases of contamination. Biotic activity would tend to move clean soil from depth, thereby reducing the average concentrations in the 0 to 6 in. interval at these sites.

4. All of the exposure parameters used in the occupational risk calculations were upper-bound values in accordance with EPA risk assessment guidance. These values cause the risk results to be upper-bound estimates, even if some of the concentration terms used at some of the sites were slightly underestimated. Not modeling biotic uptake in the occupational scenario evaluation is a source of uncertainty in the occupational scenario risk results, but this uncertainty is expected to be small in comparison to other uncertainties associated with the site concentration terms.

The only contaminant loss mechanism considered in the BRA is radioactive decay. Other loss mechanisms such as leaching and wind erosion are assumed to be negligible. The reason for this assumption is that environmental sampling has shown that most contaminants do not migrate from most INEEL sites. As a result of this observation, very few studies have been performed to evaluate contaminant loss mechanisms. Therefore, very little site-specific information is available to estimate the exact effects of these removal mechanisms.

Omitting contaminant loss mechanisms other than radioactive decay tends to overestimate risk for all exposure routes because it leads to assuming a given mass of contaminant will cause exposures by multiple exposure routes. For example, leaching is omitted in the soil pathway analysis even though leaching is the mechanism that produces the contamination evaluated in the groundwater pathway analysis. As a result of the omission, a given mass of contamination can affect both the soil pathway and groundwater pathway risk results. Upper-bound infiltration and contaminant leachability assumptions are used in the groundwater pathway analysis to estimate future groundwater contaminant concentrations. Applying these same upper-bound assumptions to the soil pathway analysis likely would produce an underestimation of soil pathway risks. To avoid this possibility, leaching is omitted from the soil pathway analysis, so that upper-bound risk results are calculated for both the soil pathway and groundwater pathway exposure routes.

One of the purposes of the BRA is to estimate upper-bound risks from WAG 6 and 10 contaminant releases based on best available site-specific information. Omitting removal mechanisms that have not been studied on a site-specific basis and that are likely to produce only small errors in the calculated risk results is consistent with this objective.

The residential exposure scenario evaluated in the BRA incorporates the assumption that potential future residents will dig into the contaminated sites at WAG 6 and 10 and spread the contaminated soil around their homes. As a result, the scenario simulates future residential exposure to average contaminant concentrations that exist in the top 3 m (10 ft) of the sites. This assumption is referred to as the residential intrusion assumption (see Appendix D-1.1).

The intrusion assumption generally produces upper-bound risk estimates for release sites that have contamination located beneath the shallow surface soils. Averaging the deeper contamination with the shallow contamination produces an upper-bound estimate of the site's exposure point soil concentration. The intrusion assumption, however, does not produce upper-bound exposure estimates at sites that only have shallow surface contamination.

At a shallow surface release site, soil pathway risk estimates that are calculated using the average concentration in the 0 to 0.5-ft interval for a given contaminant would be higher than the estimates presented in the BRA. Specifically, the increase in the risk estimates would be equal to the ratio of the contaminant's concentration in the 0 to 0.5-ft interval. For example, if a site had a contaminant with an average concentration of 100 mg/kg in the 0 to 0.5-ft interval, an average concentration of 10 mg/kg in the 0 to 10 ft interval, and a calculated residential soil ingestion risk equal to 1E-06, the soil ingestion risk that would be calculated using the 0 to 0.5-ft average concentration would equal 1E-05 [1E-06 × (100 mg/kg)/(10 mg/kg) = 1E-05]. This example illustrates that the depth of intrusion for potential future residents is a significant source of uncertainty in the BRA exposure assessment. WAG 6 and 10 sites in which the intrusion assumption may not be conservative can be identified by comparing the 0 to 0.5-ft concentration for a given COPC, as shown in Appendix E, to the 0 to 10-ft average concentration for the contaminant.

4.1.4.3 Toxicity Assessment Uncertainties. Several important measures of toxicity are needed to conduct an assessment of risk to human health. Reference doses are applied to the oral and inhalation exposure to evaluate noncarcinogenic and developmental effects, and SFs are applied to the oral and inhalation exposures to carcinogens. Reference doses are derived from no-observed-adverse-effect levels (NOAELs) or lowest observed-adverse-effect levels (LOAELs), and the application of uncertainty factors and modifying factors. Uncertainty factors are used to account for the variation in sensitivity of human subpopulations and the uncertainty inherent in extrapolation of the results of animal studies to humans while modifying factors account for additional uncertainties in the studies used to derive the NOAEL or LOAEL. Uncertainty associated with SFs is accounted for by an assigned weight-of-evidence rating that reflects the likelihood of the toxicant being a human carcinogen. Weight-of-evidence classifications are tabulated in Table E4-1 in Appendix E.

4.1.4.4 Risk Characterization Uncertainties. The last step in the risk assessment is risk characterization. As discussed in Section 4.1.3, risk characterization is the process of integrating the results of the exposure and toxicity assessments. The uncertainties defined throughout the analysis process are combined and presented as part of the risk characterization to provide an understanding of the overall uncertainty in the estimate of risk. This qualitative assessment of uncertainty is presented in Table D-1. Appendix E contains a complete presentation of the risk estimates and Section 18 includes a summary of WAG 6 and 10 risks.

Because some of the contaminants detected at WAG 6 and 10 release sites do not have available toxicity information (e.g., lead, chloride, sulfate, and 2-pentanone), risks and hazard quotients could not be calculated for these contaminants. As a result, if the contaminants have the potential for producing adverse health impacts, the risks and hazard quotients at the release sites that contain these contaminants are underestimated.

4.1.5 Uncertainties in the Facilities Assessment Analysis.

As discussed in Section 6, the facilities assessment analysis examined the potential contributions to risk from discontinued, ongoing, and future operations at WAG 6. Buildings and structures with a history of releases not under current, appropriate management controls and those that possess the potential to impact cumulative risk at WAG 6 sites would be retained for consideration in the BRA. However, no such facilities or structures were identified in the facilities assessment analysis for EBR-I.

Management controls are adequate to address contaminant releases from EBR-I site and HTRE assemblies to the environment from facility activities. All historical releases have either been remediated in the past or have been identified with a WAG 6 CERCLA site.

In the future, the facility assessment sites will undergo deactivation, decontamination, and decommissioning (D&D&D). As always, the general objective of D&D&D is to take all reasonable measures to minimize worker exposure to radiological, chemical, and industrial hazards and prevent the release of contaminants to the environment. It is possible that D&D&D will discover a past release, but all of the CERCLA sites at EBR-I are relatively remote from the risk issues identified for the facility assessment sites. It is unlikely any D&D&D discovery would affect the risk calculations for the CERCLA sites. When D&D&D is complete, WAG 6 will resume management of EBR-I and evaluate any potential residual risk.

The facilities assessment analysis did not identify any additional sites for evaluation in the WAG 6 and 10 comprehensive RI/BRA. The analysis was based on the assumptions that appropriate management controls will be maintained and enforced to ensure future protection of human health and the environment and that all significant historical releases within WAG 6 have been identified. The uncertainty associated with these two assumptions cannot be quantified but is considered very low in a qualitative sense.

4.2 Waste Area Groups 6 and 10 Ecological Risk Assessment Methodology

This subsection provides an overview of the methodology used to evaluate the WAGs 6 and 10 sites for potential risk to ecological receptors. The WAG 6 and 10 ERA methodology is contained in Appendix F, and summarized within each section in the RI/FS as appropriate. The ERA results for WAGs 6 and 10 sites were summarized with the results of other WAG ERAs for use in the OU 10-04 ERA in Appendix H. The assessment was consistent with the methods used for other WAG ERAs, while accounting for the unique aspects of the OU 10-04.

The general goals of the WAG ERA are to:

- Define contamination extent with respect to ecological receptors for each site within a WAG
- Determine the actual or potential effects of contaminants on wildlife (including threatened and endangered [T/E] and other species of concern), habitats, or special environments at the WAG level
- Identify sites and COPCs to be carried to the OU 10-04 ERA
- Supply input to remedial action (RA) decisions at the WAG level.

4.2.1 Problem Formulation

The goal of problem formulation is to investigate the interactions between the stressor characteristics, the ecosystem potentially at risk, and the ecological effects (EPA 1992). For WAGs 6 and 10, this process began with a general description of the site and a characterization of the ecosystem at risk. Next, the potential stressors to the ecosystem were identified, the migration pathways of the identified stressors were modeled, and the potentially affected components of the ecosystem were identified. The ecosystems at risk and stressor characterization with exposure pathways were then assimilated into the conceptual site model. The problem formulation phase results in characterization of stressors (i.e., identification of contaminants), definition of the assessment endpoints, and definition of ecological effects used to analyze risk using the conceptual site model.

4.2.2 Analysis

The analysis phase consists of (a) the exposure assessment (characterization of exposure) (EPA 1992) and (b) the ecological effects analysis. The effects (or stressor-response) assessment characterizes the toxicity of stressors to selected receptors. Effects of the contaminants on those individual species identified as potential receptors were quantified as toxicity reference values (TRVs). The exposure assessment incorporated the information gathered during the problem formulation phase (i.e., contaminant migration and pathways model and stressor characterization) to identify actual or potential exposure routes to ecological receptors and evaluate the magnitude of exposure to those receptors.

4.2.2.1 Exposure Assessment. Data on the nature and extent of contamination that were used as input to the ERA exposure assessment were obtained from the human health data evaluation described in Section 4.1.1. The ecological receptor exposure assessment quantified the receptor intake of COPCs for selected pathways. The assessment consisted of estimating the magnitude, frequency, and duration of exposure for each exposure route between the environment and the ecological receptors. The pathways and associated exposure routes that were evaluated for the WAG 6 and 10 sites ERA are summarized in Figures 4-3 and 4-4. Note that currently no WAG 6 and 10 sites have been identified as having permanent surface water, so this pathway was not addressed in the ERAs. Only exposures through ingestion of contaminated media were accounted for by the WAG ERA exposure models. Receptor exposures through dermal and inhalation routes for most COPCs were assumed to be negligible.

To quantify receptor intakes, the following activities were performed for the WAG 6 and 10 sites ERA:

- Identification of contaminant sources (from HHRA).
- Identification and characterization of exposed ecological receptors (see Table 4-2).
- Evaluation of exposure pathways (Figures 4-3 and 4-4). As shown, the abiotic and biotic media that were investigated included
    - Subsurface soil
    - Surface soil
    - Vegetation
    - Prey.

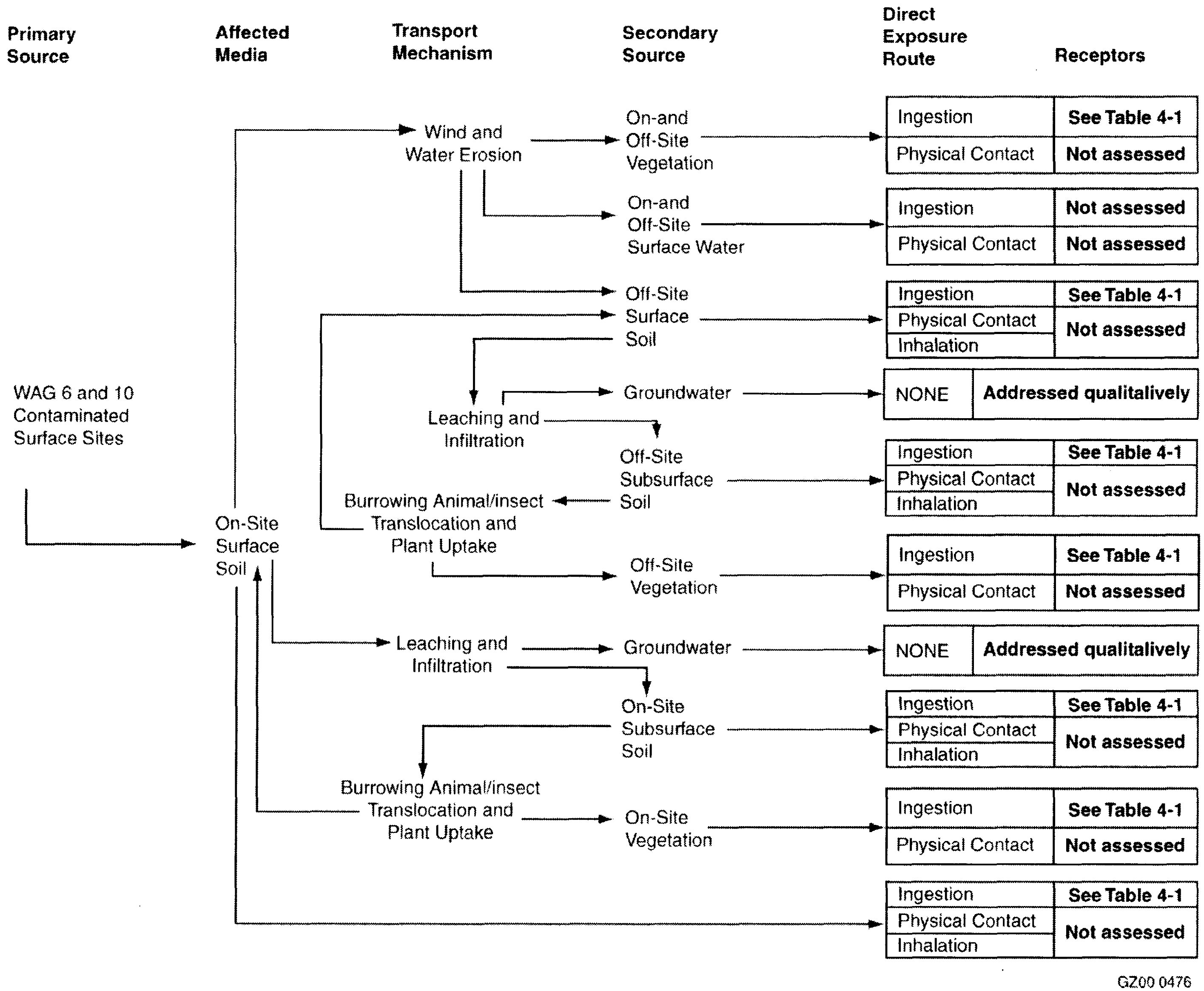

Figure 4-3. Ecological pathways/exposure model for WAG 6 and 10 surface contamination.

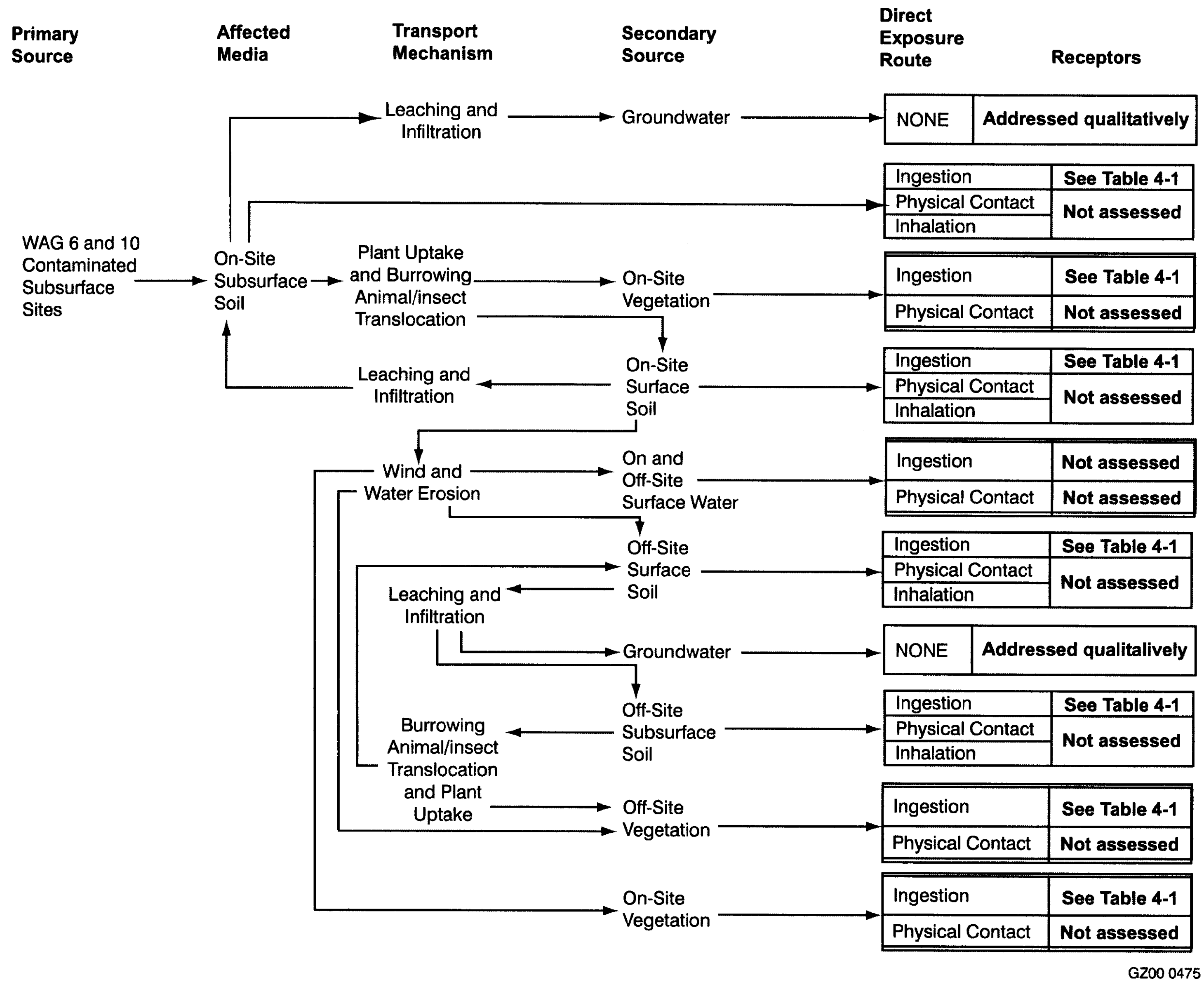

Figure 4-4. Ecological pathways/exposure model for WAG 6 and 10 subsurface contamination.

Table 4-2. Summary of WAG 6 and 10 exposure media and ingestion routes for selected INEEL species.

Receptor	Surface Soils	Subsurface Soils	Vegetation	Sediments	Invertebrates	Mammals	Birds
Great Basin spadefoot toad [a]	X	—	—	—	X	—	—
Mourning Dove	X	—	—	—	—	—	—
Blue-winged teal	—	—	X	X	—	—	—
Sage sparrow	X	—	—	—	X	—	—
Loggerhead shrike	—	—	—	—	—	X	X
Ferruginous hawk	—	—	—	—	—	X	
Burrowing owl	X	X	—	—	X	X	
Black-billed magpie	—	—	X	—	X	X	X
Mule deer	X	—	X	—	—	—	—
Pygmy rabbit	X	X	X	—	—	—	—
Townsend's western big-eared bat	X	—	—	—	X	—	—
Coyote	X	—	—	—	—	X	—
Deer mouse	X	X	X	—	X	—	—
Sagebrush lizard [a]	X	X	—	—	X	—	—
Plants	X	X	—	X	—	—	—

a. Not evaluated quantitatively.

4.2.2.2 Ecological Effects Analysis. A summary of the effects of exposure to COPCs at the WAG 6 and 10 sites was compiled from existing information from both the human health and ecological screenings and from additional information in the literature. These summaries served as a preliminary gathering of information for developing the final receptor-specific TRVs necessary for the risk characterization. TRV development and evaluation is discussed in detail in Appendix D4 of the OU 10-04 Work Plan (DOE-ID 1999). If no toxicity information was available for a contaminant, a qualitative assessment was performed based on effects from similar contaminants, and the contaminant was discussed in the uncertainty analysis.

4.2.3 Risk Characterization

Risk characterization, which is the final step of risk assessment, involves evaluating the likelihood of adverse effects as a result of exposure to stressors (EPA 1992). Risk characterization for WAG 6 and 10 included two major steps: (1) risk estimation and (2) risk description. In the risk estimation phase of the assessment, the results of the exposure assessment and ecological effects analysis were integrated to obtain an estimate of the level of effects that may result from the exposure. The results of the WAG 6 and 10 sites ERA are presented as a range of HQs calculated for selected species. The HQs were summed by receptor species to calculate the risk from multiple contaminants and pathways. A summed HQ greater than the target value (1.0 for nonradionuclides and 0.1 for radionuclides) implies a possible effect from multiple contaminants. HQs were used only as an indicator of risk and should not be interpreted as a final indication of actual adverse effects to ecological receptors, because of the uncertainty in the ERA methods. In general, the significance of exceeding a target HQ value depends on the perceived "value" (ecological, social/religious, or economic) of the receptor, the nature of the endpoint measured, and the degree of uncertainty associated with the process as a whole. Therefore, the decision to take no further action, consider corrective action, or perform additional assessment was approached on a site-, chemical-, and species-specific basis.

4.2.4 Uncertainty Assessment

The uncertainty associated with the use of multiple WAG ERAs in the OU 10-04 sitewide ERA is discussed in a separate uncertainty section in Section 17. Table 4-3 addresses the uncertainty associated with the ERA assessment performed for the WAG 6 and 10 sites. The uncertainty assessment includes a qualitative discussion of the uncertainty associated with the ERA. This provides the risk manager with an overall summary of the underlying assumptions and uncertainty in the risk assessment. Uncertainty is introduced into the assessment from any of the sources shown in Table 4-3.

4.3 OU 10-04 Ecological Risk Assessment

4.3.1 Approach

The INEEL has implemented a four-phased approach to ERA. This approach was developed specifically for use at the INEEL and was initially presented in the Screening Level Guidance for Ecological Risk Assessment at the INEEL (VanHorn et al., 1995). This approach has been updated since its initial development and the most recent version of the four phases as presented in the OU 10-04 Work Plan (DOE-ID 1999) is shown in Figure 4-5. The operable unit system established by the FFA/CO framework and the phased approach similar to the human health Track 1 and 2 assessments has allowed a systematic progression to the performance of a large scale ERA (over 2,305 km^2 [890 mi^2]). This is considered an efficient and ecologically valid approach to identify actual or potential adverse effects to INEEL ecological receptors as a result of contaminant exposure.

The OU 10-04 ERA was the third phase of the approach and was designed to use the results of the WAG ERAs as primary input. As part of the OU 10-04 problem formulation, the WAG ERA information was compiled and evaluated with the results of the other existing data and the 1997, 1999, and 2000 field sampling. The results were used to select key receptors, pathways, and COPCs, and verify models for the OU 10-04 ERA. The WAG ERA information was assessed and reviewed by the agencies during the associated WAG comprehensive RI/FSs. It is therefore considered appropriate for use as input to the OU 10-04 ERA.

The specific objectives of the OU 10-04 ERA are to:

- Define the extent of contamination with respect to ecological receptors on the WAG 10 (INEEL-wide) scale
- Determine and document the actual or potential effects of contaminants on wildlife, including T/E and other species of concern, habitats, or special environments
- Provide information for developing OU 10-04 remediation criteria
- Evaluate baseline information to define the direction of subsequent monitoring for ecological concerns at the INEEL.

The OU 10-04 ERA is summarized in Section 17. Much of the supporting information for performance of this task is contained in the OU 10-04 Work Plan (DOE-ID 1999) and in Appendix H of this document.

Table 4-3. Sources and effects of uncertainties in the ecological risk assessment.

Uncertainty Factor	Effect of Uncertainty (Level of Magnitude)	Comment
Estimation of ingestion rates (soil, water, and food)	May overestimate or underestimate risk (moderate)	Few intake ingestion rate estimates used for terrestrial receptors are based on data in the scientific literature. Food ingestion rates are calculated by using allometric equations available in the literature (Nagy 1987). Soil ingestion values are generally taken from Beyer et al. (1994).
Estimation of bioaccumulation and plant uptake factors	May overestimate or underestimate risk and the magnitude of error cannot be quantified (high).	Few bioaccumulation factors (BAFs) or plant uptake factors (PUFs) are available in the literature because they must be contaminant-, receptor-, and site-specific. In the absence of more specific information, PUFs and BAFs for metals and elements are obtained from Baes et al. (1984), and for organics from Travis and Arms (1988).
Estimation of toxicity reference values	May overestimate (high) or underestimate (moderate) risk	To compensate for potential uncertainties in the exposure assessment, various adjustment factors, as discussed in Appendix D4, are incorporated to extrapolate toxicity from the test organism to other species.
Use of selected species	May underestimate (low)	Individual species other than those assessed may have more exposure than modeled. Potentially sensitive species may not be selected for assessment.
Site use factor	May overestimate (high) or underestimate (low) risk	Site use factor is a percentage of the site of concern area compared to home range of the receptor species. Home range is not well documented for many species and may be highly variable. This can overestimate the risk at small sites.
Model uncertainties (temporal seasonal variations)	May overestimate (unknown) or underestimate (unknown) risks	Assessment of model uncertainties requires resource and time commitments that may not be justified. This may include the possibility of seasonal variation in diet.

For additional discussion on the uncertainties and assumptions concerning exposure modeling for ecological receptors, see VanHorn et al. (1995).

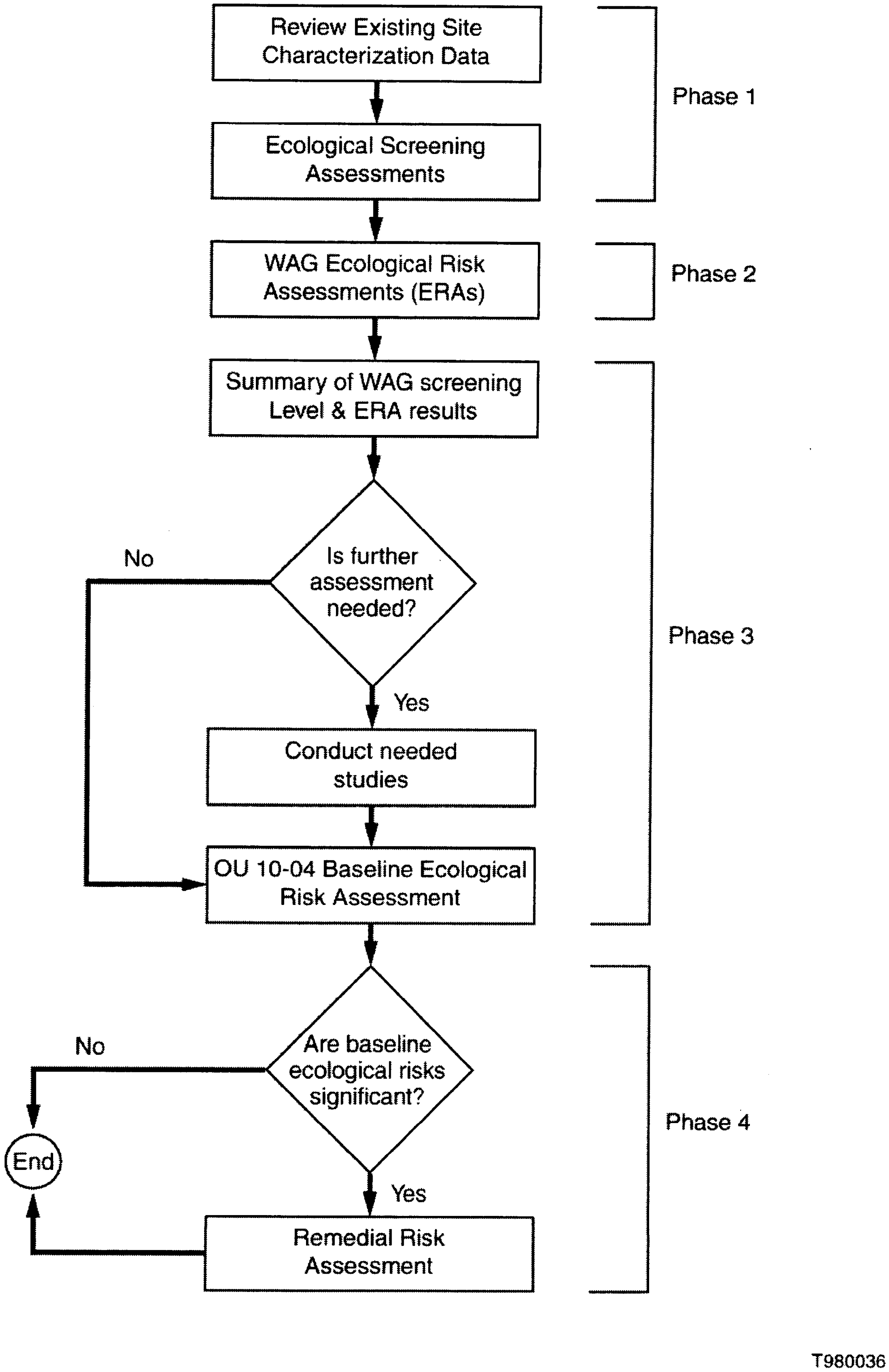

Figure 4-5. INEEL phased approach to ecological risk assessment.

4.4 Native American Evaluation

The INEEL is within the aboriginal territories of the Shoshone-Bannock Tribes. A wide variety of natural and cultural resources and areas that directly reflect tribal cultural heritage and native landscape ecology are preserved at the INEEL. These resources are important to the Shoshone-Bannock Tribes in maintaining tribal spiritual and cultural values and activities, oral tradition and history, mental and economic well being, and overall quality of life. Previous INEEL risk assessments typically have not incorporated a Native American perspective on contamination and risk. DOE sought to correct this oversight by contracting directly with the Shoshone-Bannock Tribes to conduct the appropriate tribal analyses of WAG 6 and10 data and develop input for this document.

The general approach taken in this analysis is outlined in *Risk Assessment in Indian Country: Guiding Principles and Environmental Ethics of Indigenous People* (Shoshone-Bannock Tribes 1996). The premise of the approach is that Native Americans have an intimate connection with the earth and all elements of life including plants, trees, rocks, sky, water, birds, and animals through their subsistence lifestyle, and their cultural and spiritual values. Hunting, fishing, gathering, and other activities with a direct tie to the earth and all of the elements of life play a critical role in maintaining physical and mental health as well as spiritual and cultural values. Consequently, environmental damage can impact the psychological, cultural, and economic well-being of Native American populations. In the Native American worldview, all elements of life are interconnected and integral; they cannot be separated and analyzed or quantified and ranked for protection but must be examined holistically.

The qualitative input prepared by the Shoshone-Bannock Risk Assessment Committee is reproduced in Appendix A and summarized in the main document, particularly in Sections 5 through 17 along with the results of HHRA and ERA analyses. Cumulative impacts are addressed as appropriate. Tribal input is also carried forward to the RI/BRA Summary and Conclusions in Section 18, ensuring that it is considered with the INEEL-produced quantitative data in developing remedial action objectives and response actions (Section 19).

4.5 References

Baes, C. F. III, et al., 1984, *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides Through Agriculture*, ORNL-5786, U.S. Department of Energy, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Beyer, W. N., E. E. Connor, and D. Gerould, 1994, "Estimates of Soil Ingestion by Wildlife," *Journal of Wildlife Management*, 58 2, pp. 375–382.

DOE-ID, April 1999, Work Plan for WAGs 6 and 10 OU 10-04 Comprehensive RI/FS, DOE/ID-10554, Revision 0.

DOE-ID, January 1994, Track 2 Sites: Guidance for Assessing Low Probability Hazard Sites at the INEL, DOE/ID-10389, Revision 6.

EPA, December 1989, *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A)*, EPA/540/1/1-89/002.

EPA, July 14, 1994, Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, Memorandum from E. P. Laws to Regional Administrators I-X, OSWER Directive #9355.4-12.

EPA, February 1992, *Framework-for Ecological Risk Assessment,* PB93-102192, EPA/63 O/R-92/001, U.S. Environmental Protection Agency, Office of Research and Development, Risk Assessment Forum, 55 pp.

EPA, May 1992a, *Supplemental Guidance to RAGS: Calculating the Concentration Term*, Publication 9285.7-081, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.

EPA, October 1995, *Risk-Based Concentration Table*, U.S. Environmental Protection Agency, Region 3.

Nagy, K. A., 1987, "Field Metabolic Rate and Food Requirement Scaling in Mammals and Birds," *Ecological Monograph*, Vol. 57, pp. 111–128.

Shoshone-Bannock Tribes, 1996, *Risk Assessment in Indian Country: Guiding Principles and Environmental Ethics of Indigenous People.*

Travis, C. C. and A. D. Arms, March 1988, "Bioconcentration of Organics in Beef, Milk, and Vegetation," *Environmental Science and Technology*, Vol. 22, pp. 271–274.

VanHorn, R. L., N. L. Hampton, and R. C. Morris, April 1995, *Guidance Manual for Conducting Screening Level Ecological Risk Assessment at the INEL, Idaho National Engineering Laboratory,* EG&G Idaho Inc., Idaho Falls, ID, INEL-95/0190, 1995.

Section 5

CONTENTS

FIGURES

5. WAG 6, EBR-03, EBR-I SEEPAGE PIT AND EBR-04, EBR-I SEPTIC TANK

5.1 Site Description

The EBR-03 Seepage Pit (WMO-702) and the EBR-04 Septic Tank (WMO-701) are located east of the Waste Management Office building (WMO-601) and building addition as shown in Figure 5-1 (WMO-601A). The seepage pit received waste directly from the septic tank. The septic tank and its associated seepage pit were used to treat sanitary waste discharges from WMO-601 and WMO-601A. The office building was constructed in 1956, and it is assumed that the septic system was built at the same time. Buildings WMO-601 and WMO-601A were demolished in 1995 by the D&D program. As part of the D&D, the EBR-03 Seepage Pit was excavated (Burket and Thiel 1995) along with the EBR-04 Septic Tank and the 42.7-m (140-ft) pipe extending from the tank to the pit. Samples specific to EBR-03 excavation area were not collected.

5.2 Previous Investigations and Remediations

EBR-03 and EBR-04 were subject to an Initial Assessment and priority ranking in October of 1986 (EG&G 1986). Based on the findings of the Initial Assessment, the sites were proposed for removal from the list of potential hazardous waste disposal sites, because there was no evidence that hazardous waste had entered the system (EG&G 1987). The No Action Documentation Package was submitted and approved for EBR-03 in 1993 (Paarmann 1993).

During the 1995 D&D activities, radionuclide-contaminated product was discovered in the EBR-04 Septic Tank associated with the EBR-03 Seepage Pit (Burns 1995). The tank contained three phases, a sludge layer, a liquid phase, and a crust covering the liquid. In July 1995, one sample was collected from each of the phases. The samples were analyzed for alpha-spectroscopy isotopes, tritium, Sr-89/90, toxicity characteristic leaching procedure (TCLP) metals, and volatile organic compounds (VOCs). The concentrations of radionuclides in the solid phases of the tank contents were found to be similar to the background soil concentration at the INEEL with the exception of uranium isotopes and Am-241, which were slightly elevated (Burns 1995). The only metal detected in the samples was barium, in both the sludge and the crust, with concentrations well below the TCLP regulatory limit. No VOCs were detected in any of the TCLP analyses.

Based on the analysis of the tank contents, five samples of soil were collected from the bottom of the septic tank excavation and analyzed for plutonium and uranium isotopes and Am-241. The samples were collected from the bottom of the excavated area at a depth of 4.9 to 5.2 m (16–17 ft.). Summary statistics and analytical results for the samples are provided in Appendix C.

5.3 Nature and Extent of Contamination

EBR-04 and EBR-03 were retained for evaluation because of the radionuclide-contaminated product discovered during D&D of the septic tank in 1995. Elevated levels of uranium isotopes and Am-241 were detected in the solids in the septic tank. There was no detection of Am-241 or Pu-239/240

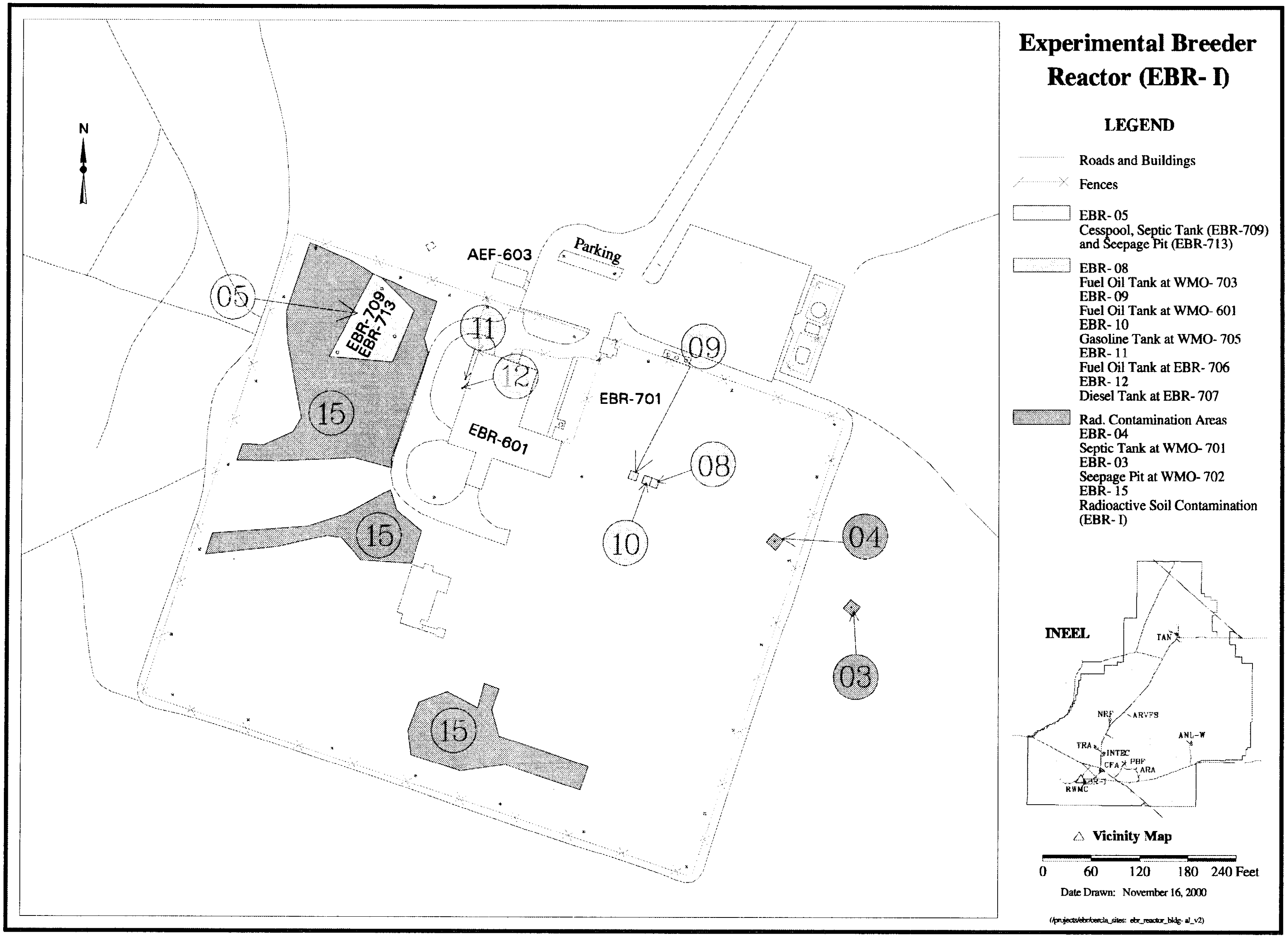

Figure 5-1. Experimental Breeder Reactor I Sites.

in the soil samples taken from the bottom of the excavation. Pu-238 was detected in two of five soil samples with a maximum value of 0.032 pCi/g. U-234 and U-238 were detected in all five soil samples with maximum values of 1.11 pCi/g and 1.22 pCi/g, respectively. U-235 was detected in four of five samples with a maximum value of 0.090 pCi/g.

Laboratory analysis of the tank contents indicated that the assumption that the septic tank and seepage pit did not receive hazardous waste was valid. The seepage pit was excavated, and the materials that were removed were sent for disposal. However, no samples were collected at the seepage pit excavation. Therefore, there are no data available to determine the nature and extent of contamination remaining below the depth of the excavation.

5.4 Preliminary Screening

The EBR-03 Seepage Pit was retained for evaluation because of the radionuclide-contaminated product associated with the EBR-04 Septic Tank. Because EBR-03 received waste from EBR-04, the potential for contamination of both areas existed.

Analysis of the contents of the septic tank (EBR-04) supported the assumption that no hazardous wastes were received by this septic tank and seepage pit system. Uranium isotopes and Am-241 were found at slightly elevated levels in the solids sampled in the septic tank and could be COPCs for the seepage pit. However, the seepage pit is assumed to be typical of those found on the INEEL with a depth of 3.05 m (10 ft) belowgrade. Thus, any contamination potentially remaining is at a depth below the residential risk assessment scenario and the ecological risk scenario.

The soil data collected from the 1995 post-excavation sampling effort for EBR-04 were screened for COPCs. The HHRA and ERA screening methodology are discussed in Section 4 and presented in detail in Appendices D and F, respectively. As shown in Appendix G, all detected radionuclides were below the INEEL background levels or the PRGs or ecologically based screening levels (EBSLs). No analytes were retained as COPCs for either the HHRAs or ERAs for the septic tank (EBR-04).

5.5 Risk Assessment

5.5.1 Human Health

No HHRA was performed for these sites. For the septic tank, all potential COPCs were screened out. Potential contamination remaining at the seepage pit excavation is all below 3.05 m (10 feet) bgs and, therefore, presents an incomplete exposure pathway.

5.5.2 Ecological

No ERA was performed for these sites. For the septic tank, all potential COPCs were screened out. Potential contamination remaining at the seepage pit excavation is all below 3.05 m (10 feet) bgs and, therefore, no significant pathway exists to ecological receptors.

5.5.3 Native American

The INEEL is within the aboriginal territories of the Shoshone-Bannock Tribes. A wide variety of natural and cultural resources and areas that directly reflect tribal cultural heritage and native landscape ecology are preserved at the INEEL. These resources are important to the Shoshone-Bannock Tribes in maintaining tribal spiritual and cultural values and activities, oral tradition and history, mental and economic well being, and overall quality of life. Appendix A contains a qualitative analysis of WAGs 6 and 10 prepared by the Shoshone-Bannock Tribal Risk Assessment Committee. General tribal concerns about EBR-I and associated release sites are summarized in Section 6.2.4.

5.6 Uncertainties

No sampling was conducted at the seepage pit (EBR-03). Potential contamination remaining below 3.1 m (10 ft) bgs has not been evaluated. No risk assessment beyond the preliminary screening, was performed at either EBR-03 or EBR-04.

5.7 Conclusions and Recommendations

The potential risk presented by the EBR-03 seepage pit is limited, because the seepage pit does not appear to have received hazardous waste. Therefore, this site is recommended for no further action and will not be evaluated in the feasibility study.

The EBR-04 septic tank was sampled during the 1995 D&D activity. All detected radionuclides were below INEEL background or PRG/EBSL. Therefore, this site is recommended for no further action and will not be evaluated in the feasibility study.

5.8 References

Burket, A.R. and T.N. Thiel, March 1995, Demolition Plan for WMO-601/601A and AEF-603, INEL-95/034, Idaho National Engineering Laboratory.

Burns, S.M., June 1995, Operable Unit (OU) 10-06 Non Time Critical Removal Action (NTCRA) Engineering Evaluation Cost Analysis (EE/CA) Approval Memorandum, 10021, Revision 0.

EG&G, 1987, WAG 6 No Action Documentation Package, Summary Assessment, ARDC AR 1.7.

EG&G, 1986, WAG 6 No Action Documentation Package, Initial Assessment, ARDC AR 1.7.

Paarmann, 1993, No Action Documentation Package and Approval.